

0. NUMERAL SYSTEMS

OPTION A.

① Do the following operations:

$$\begin{array}{r} 47636_{(8)} \\ + 50657_{(8)} \\ \hline 120515_{(8)} \end{array}$$

$$\begin{array}{r} 40430_{(5)} \\ - 24303_{(5)} \\ \hline 11122_{(5)} \end{array}$$

$$\begin{array}{r} 10010_{(2)} \\ - 01001_{(2)} \\ \hline 01001_{(2)} \end{array}$$

② Do the following operations:

$$\begin{array}{r} 4607_{(8)} \\ \times 365_{(8)} \\ \hline 27643 \\ 34452 \\ 16225 \\ \hline 2217063_{(8)} \end{array}$$

$$\begin{array}{r} 35 \overline{) 18} \\ 34 \\ \hline \end{array}$$

$$\begin{array}{r} 30 \overline{) 18} \\ 63 \\ \hline \end{array}$$

$$\begin{array}{r} 23 \overline{) 18} \\ 72 \\ \hline \end{array}$$

$$\begin{array}{r} 42 \overline{) 18} \\ 25 \\ \hline \end{array}$$

$$\begin{array}{r} 36 \overline{) 18} \\ 44 \\ \hline \end{array}$$

$$\begin{array}{r} 28 \overline{) 18} \\ 43 \\ \hline \end{array}$$

$$\begin{array}{r} 21 \overline{) 18} \\ 52 \\ \hline \end{array}$$

$$\begin{array}{r} 28 \overline{) 18} \\ 22 \\ \hline \end{array}$$

$$\begin{array}{r} 14 \overline{) 18} \\ 61 \\ \hline \end{array}$$

$$\begin{array}{r} 16 \overline{) 18} \\ 02 \\ \hline \end{array}$$

$$\begin{array}{r} 15 \overline{) 18} \\ 71 \\ \hline \end{array}$$

$$\begin{array}{r} 4302_5 \\ - 2413_5 \\ \hline 1334_5 \end{array}$$

$$\begin{array}{r} 11010_2 \\ \times 1101_2 \\ \hline 11010 \\ 00000 \\ 11010 \\ 11010 \\ \hline 10101001_2 \end{array}$$

③ Do the addition table and multiplication table in base 3.

+	0	1	2
0	0	1	2
1	1	2	10
2	2	10	11

•	0	1	2
0	0	0	0
1	0	1	2
2	0	2	11

④ Convert the following numbers to decimal:

$$1010010_2 = 0 + 1 \cdot 2 + 0 \cdot 2^2 + 0 \cdot 2^3 + 1 \cdot 2^4 + 0 \cdot 2^5 + 1 \cdot 2^6 = 2 + 16 + 64 = 82$$

(3)

$$4320_{(5)} = 0 + 2 \cdot 5 + 3 \cdot 5^2 + 4 \cdot 5^3 =$$

$$= 10 + 3 \cdot 25 + 4 \cdot 125 = 10 + 75 + 500 =$$

$$= 585$$

$$673_{(8)} = 3 + 7 \cdot 8 + 6 \cdot 8^2 = 3 + 56 + 6 \cdot 64 =$$

$$= 3 + 56 + 384 = 443$$

⑤ Convert to the indicated base the following decimal numbers:

$$\begin{array}{r}
 536 \quad | \quad 2 \\
 \hline
 13 \quad 268 \quad | \quad 2 \\
 16 \quad 06 \quad \hline
 \boxed{0} \quad 08 \quad | \quad 2 \\
 \hline
 14 \quad 134 \quad | \quad 2 \\
 14 \quad 07 \quad \hline
 \boxed{0} \quad 07 \quad | \quad 2 \\
 \hline
 \boxed{1} \quad 13 \quad 16 \quad | \quad 2 \\
 \hline
 \boxed{1} \quad \boxed{0} \quad 8 \quad | \quad 2 \\
 \hline
 \boxed{0} \quad 4 \quad | \quad 2 \\
 \hline
 \boxed{0} \quad 2 \quad | \quad 2 \\
 \hline
 \boxed{0} \quad 1
 \end{array}$$

$$536 = 1000011000_{(2)}$$

(4)

$$\begin{array}{r}
 5296 \quad | 5 \\
 \hline
 029 \quad 1059 \quad | 5 \\
 \hline
 46 \quad 05 \quad 211 \quad | 5 \\
 \hline
 \boxed{1} \quad 09 \quad 11 \quad 42 \quad | 5 \\
 \hline
 \quad \boxed{4} \quad \boxed{1} \quad \boxed{2} \quad 8 \quad | 5 \\
 \hline
 \quad \quad \quad \boxed{3} \quad \boxed{1}
 \end{array}$$

$$5296 = 132141_5$$

$$\begin{array}{r}
 32506 \quad | 8 \\
 \hline
 050 \quad 4063 \quad | 8 \\
 \hline
 26 \quad 063 \quad 507 \quad | 8 \\
 \hline
 \boxed{2} \quad \boxed{7} \quad 27 \quad 63 \quad | 8 \\
 \hline
 \quad \quad \boxed{3} \quad \boxed{7} \quad \boxed{7}
 \end{array}$$

$$32506 = 77372_8$$

⑥ Convert the following numbers to the indicate base:

$$\begin{aligned}
 100101_2 &= 1 + 0 \cdot 2 + 1 \cdot 2^2 + 0 \cdot 2^3 + 0 \cdot 2^4 + 1 \cdot 2^5 \\
 &= 1 + 2 + 32 = 35 = 120_5
 \end{aligned}$$

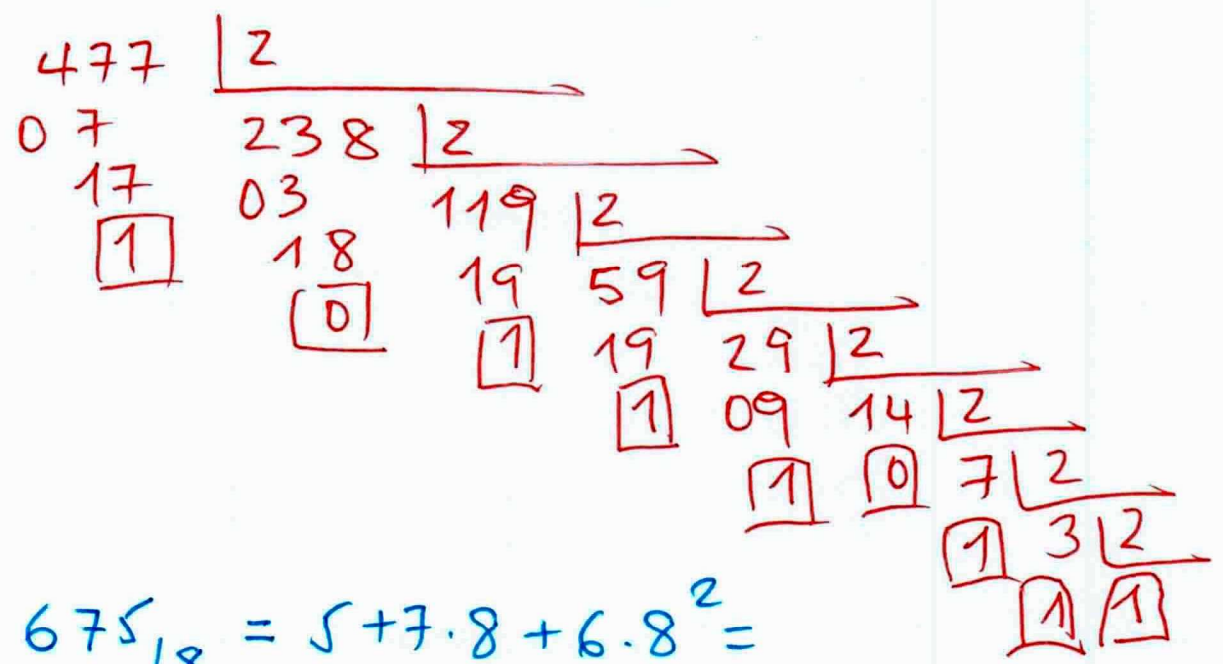
$$\begin{array}{r}
 35 \quad | 5 \\
 \hline
 \boxed{0} \quad 7 \quad | 5 \\
 \hline
 \quad \boxed{2} \quad \boxed{1}
 \end{array}$$

5

$$3402_5 = 2 + 0 \cdot 5 + 4 \cdot 5^2 + 3 \cdot 5^3 =$$

$$= 2 + 4 \cdot 25 + 3 \cdot 125 = 2 + 100 + 375 =$$

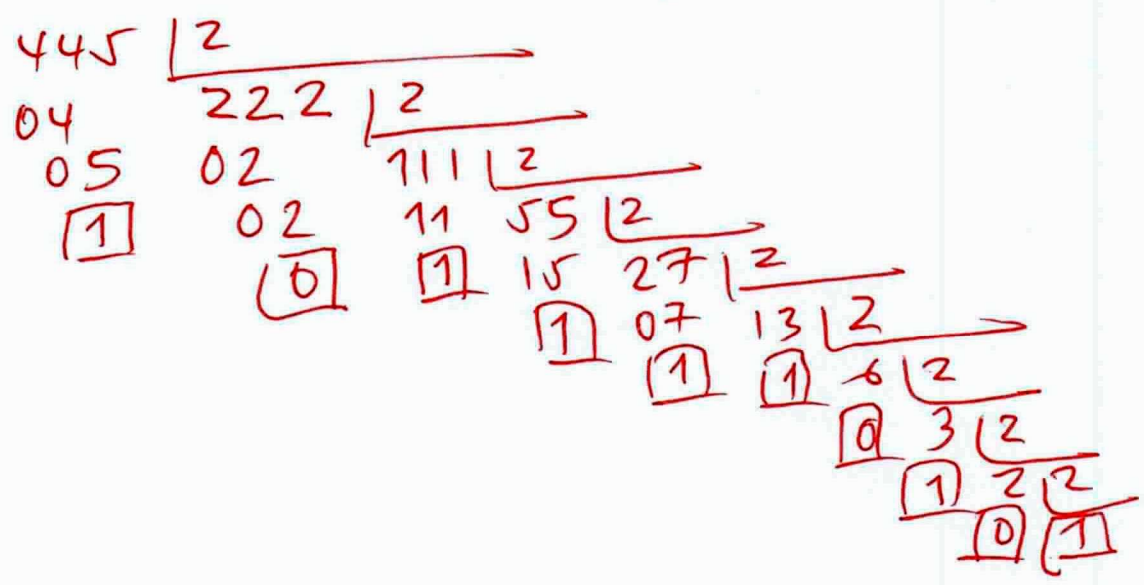
$$= 477 = 111011101_2$$



$$675_8 = 5 + 7 \cdot 8 + 6 \cdot 8^2 =$$

$$= 5 + 56 + 6 \cdot 64 = 5 + 56 + 384 =$$

$$= 445 = 101011101_2$$



00. NUMERAL SYSTEMS

OPTION
B

① Do the following operations:

$$\begin{array}{r} 60736_{(8)} \\ + 53077_{(8)} \\ \hline 134035_{(8)} \end{array} \quad \begin{array}{r} 34020_{(5)} \\ - 21303_{(5)} \\ \hline 12212_{(5)} \end{array}$$

$$\begin{array}{r} 10010_{(2)} \\ - 01001_{(2)} \\ \hline 01001_{(2)} \end{array}$$

② Do the following operations:

$$\begin{array}{r} 6057_{(8)} \\ \times 475_{(8)} \\ \hline 36353 \\ 52371 \\ 302\cancel{7}4 \\ \hline 3611663_{(8)} \end{array} \quad \begin{array}{r} 35\overline{)8} \\ \underline{3}4 \\ 30\overline{)8} \\ \underline{6}3 \\ 31\overline{)8} \\ \underline{7}3 \\ 28\overline{)8} \\ \underline{4}3 \\ 24\overline{)8} \\ \underline{0}3 \end{array} \quad \begin{array}{r} 29\overline{)8} \\ \underline{5}3 \\ 49\overline{)8} \\ \underline{1}6 \\ 42\overline{)8} \\ \underline{2}5 \\ 23\overline{)8} \\ \underline{7}2 \end{array}$$

②

$$\begin{array}{r} 4042_5 \\ - 3213_5 \\ \hline 324_5 \end{array}$$

$$\begin{array}{r} 11010_2 \\ \times 1101_2 \\ \hline 11010 \\ 00000 \\ 11010 \\ 11010 \\ \hline 10101001_2 \end{array}$$

③ Do the addition table and multiplication table in base-5

+	0	1	2	3	4
0	0	1	2	3	4
1	1	2	3	4	10
2	2	3	4	10	11
3	3	4	10	11	12
4	4	10	11	12	13

•	0	1	2	3	4
0	0	0	0	0	0
1	0	1	2	3	4
2	0	2	4	11	13
3	0	3	11	14	22
4	0	4	13	22	31

(3)

④ Convert the following numbers to decimal:

$$110101_2 = 1 + 0.2 + 1.2^2 + 0.2^3 + 1.2^4 + 1.2^5 = 1 + 0.2 + 0.4 + 0.8 + 1.6 + 3.2 = 53$$

$$3024_5 = 4 + 2 \cdot 5 + 0 \cdot 5^2 + 3 \cdot 5^3 = 4 + 10 + 0 + 375 = 389$$

$$706_8 = 6 + 0 \cdot 8 + 7 \cdot 8^2 = 6 + 0 + 448 = 454$$

$$6 + 0 + 7 \cdot 64 = 6 + 448 = 454$$

⑤ Convert to the indicated base the following numbers:

$$\begin{array}{r} 924 \div 2 = 462 \text{ R } 0 \\ 462 \div 2 = 231 \text{ R } 0 \\ 231 \div 2 = 115 \text{ R } 1 \\ 115 \div 2 = 57 \text{ R } 1 \\ 57 \div 2 = 28 \text{ R } 1 \\ 28 \div 2 = 14 \text{ R } 0 \\ 14 \div 2 = 7 \text{ R } 0 \\ 7 \div 2 = 3 \text{ R } 1 \\ 3 \div 2 = 1 \text{ R } 1 \end{array}$$

$$924 = 1110011100_2$$

④

$$\begin{array}{r}
 3958 \mid 5 \\
 \hline
 45 \quad 791 \mid 5 \\
 \hline
 08 \quad 29 \quad 158 \mid 5 \\
 \hline
 \boxed{3} \quad 41 \quad 08 \quad 31 \mid 5 \\
 \hline
 \quad \boxed{1} \quad \boxed{3} \quad \boxed{1} \quad 6 \mid 5 \\
 \hline
 \quad \quad \quad \boxed{1} \quad \boxed{1}
 \end{array}$$

$$3958 = 111313_5$$

$$\begin{array}{r}
 73564 \mid 8 \\
 \hline
 15 \quad 9195 \mid 8 \\
 \hline
 76 \quad 11 \quad 1149 \mid 8 \\
 \hline
 44 \quad 39 \quad 34 \quad 143 \mid 8 \\
 \hline
 \boxed{4} \quad 75 \quad 29 \quad 63 \quad 17 \mid 8 \\
 \hline
 \quad \boxed{3} \quad \boxed{5} \quad \boxed{7} \quad \boxed{1} \quad \boxed{2}
 \end{array}$$

$$73564 = 217534_8$$

⑥ Convert the following numbers to the indicated base:

$$\begin{aligned}
 101011_2 &= 1 + 1 \cdot 2 + 0 \cdot 2^2 + 1 \cdot 2^3 + 0 \cdot 2^4 + 1 \cdot 2^5 \\
 &= 1 + 2 + 8 + 32 = 43
 \end{aligned}$$

$$\begin{array}{r}
 43 \mid 5 \\
 \hline
 \boxed{3} \quad 8 \mid 5 \\
 \hline
 \quad \boxed{3} \quad \boxed{1}
 \end{array}$$

$$101011_2 = 133_5$$

$$2344_{(5)} = 4 + 4 \cdot 5 + 3 \cdot 5^2 + 2 \cdot 5^3 =$$

(5)

$$= 4 + 20 + 3 \cdot 25 + 2 \cdot 125 = 4 + 20 + 75 + 250 =$$

$$= 349 = 101011101_{(2)}$$

349	2				
14		174	2		
09		14		87	2
[1]		[0]		07	2
				[1]	
				03	2
				[1]	
				01	2
				[1]	
				0	2
				[0]	
				5	2
				[1]	
				2	2
				[0]	
				1	2
				[1]	

~~349~~

$$754_{(8)} = 4 + 5 \cdot 8 + 7 \cdot 8^2 =$$

$$= 4 + 40 + 7 \cdot 64 = 4 + 40 + 448 =$$

$$= 492 = 111101100_{(2)}$$

492	2				
09		246	2		
12		04		123	2
[0]				03	2
				[1]	
				01	2
				[1]	
				30	2
				[0]	
				15	2
				[1]	
				7	2
				[1]	
				3	2
				[1]	
				1	2
				[1]	